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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09 921,383 | 08 02 2001 | Sidney Bennett | KVC-037.01 | 6916 |

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EXAMINER

CONNOLLY, PATRICK J

ART UNIT PAPER NUMBER

2877

DATE MAILED: 04/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/921,383

Applicant(s)

BENNETT ET AL

Examiner

Patrick J Connolly

Art Unit

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 22-26 and 36 is/are allowed.
- 6) ☒ Claim(s) 1,3-21 and 27-35 is/are rejected.
- 7) ☒ Claim(s) 2 and 10 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 August 2001 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-9, and 11-21 and 27-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,023,331 to Blake et al. (hereafter Blake) in further view of "Berry's phase analysis of polarization rotation in helicoidal fibers" by Frank Wassman and Adrian Ankiewicz (hereafter Ankiewicz)

As to claims 1, 18, and 27 Blake teaches a fiber optic interferometric current sensor comprising (see Figure 3): a fiber optic coil helically wound about a central axis to form the coil.

Blake does not teach winding without torsion or selecting a pitch angle to cause a phase shift as a result of Berry's phase.

Ankiewicz teaches using helicoidally wound fibers with no intrinsic birefringence, (see p. 3910, Conclusion) meaning that the fibers are wound without torsion or strain, in order to observe phase shifts induced by Berry's phase.

It would have been obvious to one of ordinary skill in the art at the time of invention to wind the fiber of the current sensor of Blake without torsion and to select an appropriate pitch angle to observe the effects described by Ankiewicz.

As to claim 3, Blake teaches a central axis generally in the shape of a circle.

Art Unit: 2877

As to claims 4, 7, 19 and 27 Blake teaches the circle surrounding a current carrying conductor, with the coil serving as a current sensor.

As to claims 5, 6, 8, 9, 20, 21, and 27 as Ankiewicz teaches a range of pitch angles, it would have been obvious to one of ordinary skill in the art at the time of invention to use the observations of Ankiewicz to choose an appropriate pitch angle for the current sensor of Blake.

As to claims 11 and 12, Blake teaches a cylindrical form for winding and a slot to allow the placement of a conductor along the central axis.

As to claims 13 and 27, Blake teaches counter-propagating light beams.

As to claims 14 and 28, Blake teaches quarter wave plates and couplers on each end of the coil (see Figure 2).

As to claim 15 and 29, Blake teaches a phase modulator between one of the couplers and quarter wave plates (see Figure 2).

As to claims 1, 17, 30 and 31, piezo-electric transducers and electro-optic materials are notoriously well known in the art as phase modulators and it would have been obvious to one of ordinary skill in the art at the time of invention to include such modulators in the sensor of Blake.

As to claims 32-35, Blake teaches attaching a reflector to the end of the coil (see Figure 1).

Allowable Subject Matter

Claims 22-26 and 36 allowed.

Art Unit: 2877

Claims 2 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As to claims 2 and 10, the prior art of record, taken alone or in combination, fails to disclose or render obvious a fiber optic coil helicoidally wound in alternating opposing winding directions, with a length of fiber in a region where the winding direction changes being substantially smaller than the length of the fiber in either of the opposing winding directions, in combination with the rest of the limitations of claims 2 and 10.

The following is an examiner's statement of reasons for allowance:

As to claim 22, the prior art of record, taken alone or in combination, fails to disclose or render obvious a fiber optic coil helicoidally wound in alternating opposing winding directions, with a length of fiber in a region where the winding direction changes being substantially smaller than the length of the fiber in either of the opposing winding directions, in combination with the rest of the limitations of claim 22.

Art Unit: 2877

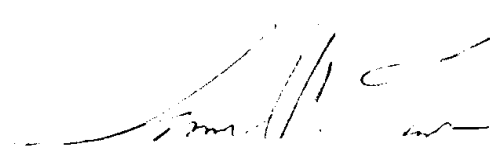
Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick J Connolly whose telephone number is 703.305.4397. The examiner can normally be reached on 9 am-5.30 pm ... Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 703.308.4881. The fax phone numbers for the organization where this application or proceeding is assigned are 703.746.7722 for regular communications and 703.746.7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703.308.0956.

pjc fjl
April 1, 2003



Samuel A. Turner
Primary Examiner